Claims 1 through 13 were rejected under §103 as unpatentable over the Yu et al. reference[3] in view of the Lundby et al. reference[4]. The Examiner found that the Yu et al. reference discloses all elements of claim 1 except for the coding operation of the transmitter, but that the Lundby et al. reference teaches an apparatus for coding first and second channels, or symbols, for transmission of a data stream on diverse channels. The Examiner further found that it would have been obvious to implement the encoding operation taught by the Lundby et al. reference at the transmitter in combination with the teachings of the Yu et al. reference, to provide a wireless communication system having the improved BER as taught by the Yu et al. reference.[5] The additional limitations of dependent claims 2 through 13 were each specifically found by the Examiner to be in the art, and the claims were rejected accordingly.[6]

Applicants respectfully traverse the §103 rejection of claims 1 through 13, on the grounds that the combined teachings of the applied references fall short of the requirements of independent claim 1. Specifically, Applicants submit that the Yu et al. reference does not teach the probability generator required by claim 1, and that the Lundby et al. reference adds no teachings in that regard.

In making the rejection of claim 1, the Examiner asserted that the Yu et al. reference teaches a probability generator by way of the combination of the "Puncturing and MUX" block, Symbol Mapper, summer +, deinterleaver π_C^{-1}, decision feedback equalizer DFE, and the demultiplexer DEMUX, with reference to Figure 5 of the reference.[7] The Examiner further asserts that this combination of elements generates first and second communication symbols (namely signals x_k^s, x_k^{p1}, and x_k^{p2}).[8]

However, Applicants submit that the combination of elements in the Yu et al. reference asserted by the Examiner does not and cannot correspond to the probability generator of claim 1. As recited in claim 1, the probability generator is required to generate, responsive to a

[3] U.S. Patent No. 6,307,901 B1, issued October 23, 2001 to Yu et al.
[4] U.S. Patent No. 6,356,528 B1, issued March 12, 2002 to Lundby et al.
[5] Office Action, *supra*, pages 2 and 3, ¶1.
[6] Office Action, *supra*, pages 2 through 4.
[7] Office Action, *supra*, page 2, ¶1.

composite communication symbol, a plurality of probabilities for corresponding first and second communication symbols represented by the composite symbol. These probabilities refer to the probability that the communication symbol has respective ones of a plurality of possible values. The claim also requires that the first and second SISO decoders receive these pluralities of probabilities from the probability generator. Applicants submit that the Yu et al. reference fails to disclose these elements of claim 1.

First, the asserted combination does not generate any probabilities, and as such is not a "probability generator". This is evident from a consideration of the signals that are output by the asserted combination. Specifically, the Yu et al. reference states that its demultiplexer DEMUX "separate[s] the samples corresponding to information bits and coded bits"[9], which as shown in Figures 4 and 5, are the bits x_k^s, x_k^{p1}, and x_k^{p2}, as asserted by the Examiner. However, these information bits x_k^s and coded bits x_k^{p1} and x_k^{p2} are not probabilities. They are instead the information and code word bit samples themselves; this is consistent with the function of demultiplexer DEMUX as being exactly that, a demultiplexer. The only other output from the asserted combination of elements of the Yu et al. reference is the output $\bar{y}_i$ of the decision feedback equalizer DFE, which is also not a probability but which instead is a channel correction signal, namely an estimation of the ISI channel output for a given sequence of estimated symbol bits that are derived from hard decisions.[10] And none of the elements of the Yu et al. reference in the asserted combination (namely, "Puncturing and MUX" block, Symbol Mapper, summer +, deinterleaver π_C^{-1}, decision feedback equalizer DFE, and the demultiplexer DEMUX) is a circuit that itself generates a probability. Accordingly, the combination of elements of the Yu et al. reference that was asserted to correspond to the probability generator of claim 1 does not in fact generate any probabilities, and therefore does not correspond to the probability generator of the claim.

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[8] *Id.*

[9] Yu et al., *supra*, column 3, lines

[10] Yu et al., *supra*, column 5, lines 35 through 37; column 6, lines 40 through 45.

Secondly, because the asserted combination does not generate any probabilities, much less the plurality of probabilities required by claim 1, the decoders DEC1 and DEC2 of the Yu et al. reference do not receive pluralities of probabilities from a probability generator. Rather, according to the Yu et al. reference, decoder DEC1 computes its soft output from the information bit samples x_k^s and the coded bit samples x_k^{p1}, and decoder DEC2 computes its soft output from the information bit samples x_k^s and the coded bit samples x_k^{p2}.[11] While each of decoders DEC1, DEC2 of the Yu et al. reference also operate upon *a priori* information in the form of log-likelihood ratios, these LLRs are received from the other one of decoders DEC1, DEC2,[12] and not from a probability generator. Accordingly, the Yu et al. reference falls short of the requirements of claim 1 regarding the inputs provided by a probability generator to the first and second SISO decoders.

The Lundby et al. reference was not asserted as teaching a probability generator, and in fact does not disclose a probability generator.

Accordingly, Applicants respectfully submit that the combined teachings of the Yu et al. and Lundby et al. references fall short of the requirements of claim 1.

Applicants further respectfully submit that there is no suggestion from the prior art to modify these combined teachings of the references so as to reach claim 1 in this case. This lack of suggestion is especially apparent considering the divergence in the function of the asserted combination of elements in the Yu et al. reference from that of the probability generator of claim 1. The feedback loop of the Yu et al. reference (which includes the asserted elements of the "Puncturing and MUX" block, Symbol Mapper, summer +, deinterleaver π_C^{-1}, and the decision feedback equalizer DFE) is intended to generate and "apply a correction to the next input of the signal before being input to the turbo decoder 150 so as to minimize the intersymbol interference".[13] Considering that the result of this feedback loop is to produce a channel

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[11] Yu et al., *supra*, column 3, lines 26 through 33, Figures 4 and 5.
[12] *Id.*
[13] Yu et al., *supra*, column 5, lines 5 through 8.

correction signal derived from hard decisions from the decoders,[14] there is no suggestion whatsoever from the Yu et al. reference to modify these teachings to generate any probabilities. In contrast, the probability generator of the claimed invention is provided to iteratively produce, in combination with the SISO decoders, the most likely value of an incoming communication symbol,[15] which is then forwarded to a decision maker that decides the value of the received input symbol.[16] Accordingly, the stated function of the asserted combination of elements from the Yu et al. reference, in providing a channel correction signal for the next input sample, is so far from the function of the probability generator of claim 1, that the Yu et al. reference itself provides no suggestion to modify its teachings so as to reach the claim. And the Lundby et al. reference provides no suggestion to modify these teachings.

For this reason, Applicants respectfully submit not only that the §103 rejection of claims 1 through 13 is in error, but also that claim 1 and its dependent claims are in fact patentably distinct over the prior art of record in this case.

Claims 18 through 26 were also rejected under §103 as unpatentable over the Yu et al. and Lundby et al. references. The Examiner asserted that the Yu et al. reference teaches all of the steps of the method of claim 18, including specifically that the demultiplexer DEMUX of Figure 5 of the Yu et al. reference applies pluralities of probabilities to the two SISO decoders, in the form of signals x_k^p, x_k^{p1}, and x_k^{p2} to meet the applying step of the claim, except for the use of first and second wireless communication channels corresponding to the results of first and second coding operations. The Examiner found this missing limitation in the Lundby et al. reference, and concluded that it would have been obvious to implement this encoding operation at the transmitter of the Yu et al. system to provide higher BER performance, as suggested by the Yu et al. reference.[17] The specific limitations of dependent claims 19 through 26 were found by the Examiner in these references.

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[14] Yu et al., *supra*, column 5, lines 35 through 37; column 6, lines 40 through 45.
[15] Specification of S.N. 09/925,077, page 11, lines 1 through 12.
[16] Specification, *supra*, page 8, lines 14 through 20.
[17] Office Action, *supra*, page 5, ¶2.

Applicants also respectfully traverse the §103 rejection of claims 18 through 26, on the grounds that the combined teachings of the references fall short of the requirements of claim 18. Specifically, Applicants submit that neither of the applied references teaches the generating of a plurality of probabilities and applying these probabilities to first and second SISO decoders, as required by claim 18.

Contrary to the asserted basis of the rejection,[18] Applicants submit that the signals x_k^s, x_k^{p1}, and x_k^{p2} are not probabilities, but instead are the information and code word bit samples themselves, consistent with the demultiplexer function of demultiplexer DEMUX that produces these signals. Accordingly, the Examiner is in error in asserting that the providing of these signals x_k^s, x_k^{p1}, and x_k^{p2} to the decoders in the Yu et al. reference meets the applying step of claim 18, because these signals are not a plurality of probabilities as required by the claim.

Furthermore, Applicants respectfully submit that the combination of the "Puncturing and MUX" block, Symbol Mapper, summer +, deinterleaver π_C^{-1}, decision feedback equalizer DFE, and the demultiplexer DEMUX of the Yu et al. reference cannot meet the step of generating a plurality of probabilities, as asserted by the Examiner.[19] As discussed above, this asserted combination does not generate any probabilities. Rather, the outputs from these elements are the information and code word bits x_k^s, x_k^{p1}, and x_k^{p2} themselves, none of which are probabilities as discussed above, and the output $\tilde{y}_i$ of the decision feedback equalizer DFE, which is also not a probability but which instead is a channel correction signal.[20] Not only does this asserted combination of elements not generate any probabilities, but in fact none of the individual elements (namely, "Puncturing and MUX" block, Symbol Mapper, summer +, deinterleaver π_C^{-1}, decision feedback equalizer DFE, and the demultiplexer DEMUX) itself generates any probability. Accordingly, the combination of elements of the Yu et al. reference that was asserted as meeting the step of generating a plurality of probabilities, as required by claim 18, does not meet this step of claim 18.

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[18] Office Action, *supra*, page 5.
[19] *Id.*
[20] Yu et al., *supra*, column 5, lines 35 through 37; column 6, lines 40 through 45.

The Lundby et al. reference was not asserted as teaching the step of generating a plurality of probabilities, and in fact this reference does not disclose such a step.

Accordingly, Applicants respectfully submit that the combined teachings of the Yu et al. and Lundby et al. references fall short of the requirements of claim 18.

Applicants further respectfully submit that there is no suggestion from the prior art to modify these combined teachings of the references so as to reach claim 1 in this case. This lack of suggestion is especially apparent considering the substantial differences between the function of the asserted combination of elements in the Yu et al. reference and, on the other hand, the claim step of generating a plurality of probabilities. As discussed above relative to claim 1, the feedback loop of the Yu et al. reference generates and applies channel correction, derived from hard decisions, to the next input sample, to minimize the intersymbol interference.[21] There is no suggestion whatsoever from the Yu et al. reference to modify these teachings to generate any probabilities, as required by claim 18. And as mentioned above, the Lundby et al. reference provides no suggestion to modify these teachings.

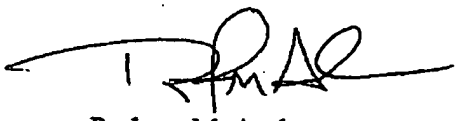
For this reason, Applicants respectfully submit that the §103 rejection of claims 18 through 26 is in error, and that these claims are in fact patentably distinct over the prior art of record in this case.

The prior art cited by the Examiner as pertinent, but not applied, has been considered but is not considered to be within the scope of the claims in this case.

[21] Yu et al., *supra*, column 5, lines 5 through 8.

For the above reasons, Applicant respectfully submits that all claims now in this case are in condition for allowance. Reconsideration of this application is therefore respectfully requested.

Respectfully submitted,



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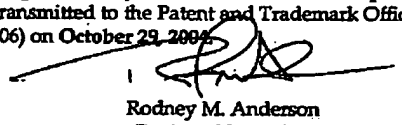

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